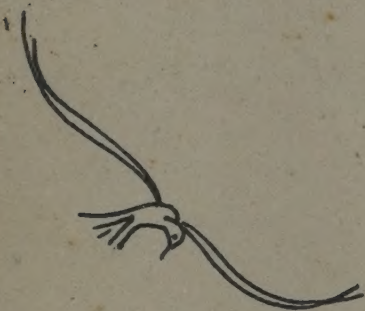


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INDIAN FISHERIES BULLETIN



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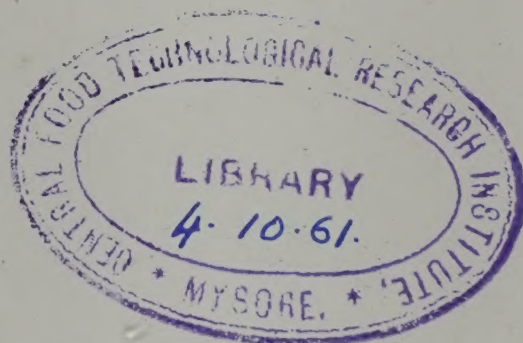
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CONTENTS

PAGE No.

A—INDIAN

I. General and Development	I
(1) Marine	1
(2) Inland	9
(3) Technology	14
(4) Trade	
(5) Socio-economics	
(6) Conservation and management	
II. Marine Fisheries Research	15
(1) Fishery Biology	16
(2) Hydrobiology	20
(3) Fishing gear and craft	
III. Inland Fisheries Research	21
(1) Fishery Biology	25
(2) Hydrobiology	
(3) Fishing gear and craft	
IV. Fish Preservation	
(1) Curing	
(2) Pickling	
(3) Salting	
(4) Drying	
(5) Refrigeration	
V. Fish products	
(1) Fish meal	
(2) Fish oil	
(3) Fish manure	

B—FOREIGN

I. General and Development	27
(1) Marine	27
(2) Inland	29
(3) Technology	30
(4) Trade	32
(5) Socio-economics	
(6) Conservation and management	33
II. Marine Fisheries Research	33
(1) Fishery Biology	33
(2) Hydrobiology	
(3) Fishing gear and craft	35

III. Inland Fisheries Research	
(1) Fishery Biology	
(2) Hydrobiology	
(3) Fishing gear and craft	
IV. Fish Preservation	39
(1) Curing	
(2) Pickling	
(3) Canning	
(4) Salting	
(5) Drying	
(6) Refrigeration	39
V. Fish Products	
(1) Fish meal	
(2) Fish oil	
(3) Fish manure	
C—GENERAL FISHERY NEWS	41

INDIAN

GENERAL AND DEVELOPMENT

MARINE

The Recommendations of the Fisheries Enquiry Committee on Rules & Regulations applicable to Motorised Fishing Vessels

The Ministry of Food & Agriculture appointed an *ad hoc* Fisheries Enquiry Committee on the 17th April, 1958, for enquiring into, reviewing and assessing the difficulties of the fishing industry in relation to the existing rules and regulations applicable to the motorised fishing vessels and formulating specific rules for fishing vessels. The Committee after examining the various difficulties experienced by the mechanized fishing vessels in the different parts of the country have made recommendations relating to registration of fishing craft, manning of vessels, life saving appliances, fire protection equipment, load line survey, port clearance, port facilities, insurance of fishing crafts and requirements for the programme of mechanization. The Committee has also suggested the provision of a separate part in the Merchant Shipping Act for matters relating to fishing vessels.

The Committee's recommendations are summarised below :—

(1) There should be a separate part in the Merchant Shipping Act for fishing vessels. A set of rules have been drafted by the Committee.

(2) *Registration of Fishing Craft* : There should be some provision for registration of mechanized fishing crafts so as to enable the Fisheries Department to watch the progress of the programme. These regulations, on an all-India basis, should be uniform for all fishing vessels in the country and distinct from the provision now made for all crafts under the State Harbour Craft Rules.

(3) *Manning of Vessels* :

(i) Due to shortage of qualified hands and in view of the need for providing adequate training facilities for such personnel, the standards at present prescribed in the Merchant Shipping Act, 1958 should not be insisted upon. The classification of the fishing vessels and the qualifications of the personnel could be governed by the rule-making powers of the Government of India. There should be provision for issue of emergency certificates by the Merchantile Marine Department till such time as trained fishermen fully satisfying the standards of proficiency become available.

(ii) Adequate facilities should be given to enable deck-hands and junior officers of fishing vessels to qualify themselves as second hands. Provision should also be made for enabling second

hands of fishing vessels to qualify themselves as Skippers. The Government of India should consider the possibility of establishing additional training centres for enabling candidates to qualify for second hands and skippers.

- (iii) There should be a certain set of rules for fishing vessels with regard to manning of vessels.
- (iv) The syllabus for the existing Fishermen Training Centres run by the Departments of Fisheries in the Maritime States should be revised. The course should be extended to a period of 12 months including practical training for three months. The fishermen trainees should be given mechanised boats by the Department or Cooperative Society for operation on share basis, wherever possible.

(4) *Pilotage* : The fishing vessels may be exempted from the engagement of pilots and payment of pilot charges. In ports, where there are heavy pilot charges as in Calcutta, the skippers of the fishing vessels might be permitted to operate without the pilots, after obtaining a permit from the port authorities.

(5) *Life Saving Appliances* : There is imperative need for prescribing simpler scale of life saving appliances for smaller fishing vessels.

(6) *Fire Protection Equipment* : The regulations for fire protection prescribed under rule 38 of the Indian Merchant Shipping Act (Fire Appliances Rules) for class XI fishing vessels may be adopted.

(7) *Load-line Survey* : The fishing vessels are exempt from load line survey. Fish carries are not exempt but the rules should be relaxed, but to the extent of the existing practice.

(8) *Port Clearance* : The formalities relating to the port regulations and customs, as applicable to the passenger and cargo boats are being applied in case of fishing vessels in certain centres. Fish carrier vessels should be given six monthly passes. Port dues should not be levied for the same fish carrier vessel at other ports in the States, unless the cargo is worked. In short, facilities should be provided to ensure that no difficulties are experienced by the fishing vessels in obtaining the port clearance.

(9) *Port facilities* :

- (i) The existing harbour facilities for the fishing industry are far from adequate and docking and landing facilities should be improved in the different sections of the coasts to promote mechanization of fishing.
- (ii) There should be close coordination between the Ministry of Transport, the State Port Departments and the State Fisheries Departments and the Port Trusts. A committee may be constituted in each Maritime State to consider the various problems and facilities required in the ports for docking, berthing, supply of fuel and water servicing of craft, rescue service, weather report etc.

- (iii) The first two phases of the programme of development of Sasoon Docks and Victoria Basin in Bombay Port should be favourably considered. The Sasoon Dock should be dredged regularly every year.
- (iv) At Calcutta, additional facilities for berthing fishing vessels and landing of fish should be provided.
- (v) At Visakapatnam, the site adjacent to the Ice & Cold Storage Plant of the State Fisheries Department may be reserved for future expansion of the fisheries activities.
- (vi) In Madras, the plans for the development of a fishing harbour near Royapuram should be taken up. The present proposal of a sea wall in Royapuram may be integrated with the programme of fishing harbour.
- (vii) Fishing harbours should be developed in the various States. A technical officer should be appointed in the Government of India for looking into the special needs of the fishing industry.
- (viii) The ports at Kandla, Veraval, Mangalore, Vizhingom, Madras and Paradwip should be developed as deep sea fishing ports.
- (ix) Slipway, docking and workshop facilities should be provided in all the ports for the fishing vessels. Some berthing facilities should be reserved exclusively in the various ports for the fishing vessels. High priority should be given to the need of the fishing industry for warehouses, godowns and the land on the water edge in the dock areas. Facilities for mooring, navigational aids and lights for channels should be provided in smaller ports for berthing small mechanized fishing vessels.

(10) *Insurance* : The risk to the fishermen trainees and fishermen should be covered by insurance as all trainees on fishing vessels work as members of the crew and run the same risk as the fishing crew.

(11) *Requirements for the programme of mechanization* :

- (i) The rate of mechanization should be accelerated.
- (ii) Adequate incentive should be extended to the trainees of the fishermen training centre by providing mechanised boats and gear at reasonable rates and giving better opportunities of gainful employment.
- (iii) The "share of the catch" system has created an incentive to the fishermen to land maximum catches of good quality fish. This system may be adopted.
- (iv) Training in the designing and construction of improved types of fishing boats should be continued at the CFTRS, Cochin.
- (v) Mechanization of fishing crafts and improved methods of fishing have been affected by the restriction on imports of

engines and synthetic fibres. It is necessary to relax the restrictions on import of these items and to see that these items are made available in India in adequate quantities. Efforts should also be made for the manufacture of dependable marine diesel engines, synthetic fibres, fabrication of winches, gurdies etc.

- (vi) Better facilities for storage, processing and transport should be provided.
- (vii) The organisation of Fisheries Cooperatives and fish marketing cooperatives is essential for developing a system to ensure a better return to the fishermen. Credit facilities should be extended to these societies in the same way as for Agricultural Cooperative Societies.
- (viii) The fishing industry should be given some relief in the form of subsidy to meet the increase in the taxes on oils, fishing, twines, etc. Special assistance should also be given for initiating marketing projects and for establishment of manufacturing concerns for fishing accessories.

(ii) Progress of work done at the Indo-Norwegian Project, Quilon for the year 1958-59

Fishing

Fishing experiments with purse seining, otter trawling, gill net, drift net and hooks and lines were done successfully with medium boats and "Flying Fish". In Cochin during the symposium on "improved methods of fishing from small mechanized boats" a successful demonstration with purse seine was carried out. Fishing grounds south of Cochin were explored. At Neendakara training centre, trainees were instructed in purse seine and gill net fishing. 'Kalava' and 'Sea-horse' carried out hook and line fishing at Cochin with trainees of Neendakara.

In Quilon the total catch amounted to 22,465 kgs. of fish and 1,074 kgs. of prawns and in Cochin the catch was 2,24,784 kgs. of fish and 1,72,863 kgs. of prawns. Thus the total catch comes up to approximately 4,21,000 kgs. of fish and prawns at a value of about Rs. 1,70,000. The corresponding figures for the last financial year were 3,43,000 kgs. fish and prawns representing a total value of about Rs. 1,18,000.

Maintenance and repairs

The boat "M-6", surf-boat No. 2 and seventeen 25' were completed, and the "M-6" has been launched. Maintenance and overhauling work on "surf-1" and 22', 25' project boats were carried out throughout the year. Work was also done on "Ashtamudi", "Flying-fish" and R/V "Kalava". Routine overhauling and repairs of electronic and electrical equipment of vessels and medium boats were done. During the symposium at Cochin an echosounder and transmitter were installed and their working demonstrated.

The repairs of purse seines, trawl nets and sardine nets were done under the supervision of a Norwegian Gear expert. Preservation and "Tanning" of nets has been done at the seahouse, Saktikulangara. The mounting of a special purse seine was completed, the material for which was brought from Norway.

Refrigeration

At the refrigeration plant 1,926.95 tons of ice were produced and 1,924.65 tons were issued. The quantities of fish and prawns frozen and stored were 39.602 tons and balance from last year was 22.264 tons. During the period 54.424 tons of frozen fish and prawns were issued.

Marketing

In Cochin the marketing of fish was carried out by the fishery officer. A regular route has been established from Palai to Yelappara *via* Kanji-rappally and Peermade. The bye-laws of the proposed sales organisation for the project area were finalised.

A committee was set up to implement the decision of the standing committee, to watch the collection of dues and to prescribe the procedure to redeem the boats from the defaulted boat owners.

Training

20 candidates were selected for training for the eighth batch. The training was given in handling, driving and maintenance of boats and engines, construction, maintenance and use of gear and different types of fishing operations. Training in purse seining was given to fishermen and an officer of Orissa State from 1st January, 1959.

Research

The charting of the oceanographical and biological conditions of the fishing grounds of the South-West Coast of India continued during the year. The research operations and trials with trawls were carried out by R/V 'Kalava' and R/V "Conch". The analysis of samples and research work has been carried out in collaboration with the CMFRS, Mandapam, and CMFR sub-station; Ernakulam and Calicut.

Health

Clinical work continued as usual. 715 school children were tuberculine tested and 312 were B.C.G. vaccinated. Vaccination against small-pox has been carried out. Hunting of stray dogs continued and 300 dogs were killed. 81 latrines were constructed.

Water supply—Pipe factory

The number of premo and low pressure pipes produced was 2,133 and 387 respectively. At the end of March 1959 the total production amounted to 4,406 premo-pipes.

Expenditure

Expenditure in Norway during the year was approximately Rs. 18.77 lakhs and in India approximately Rs. 11.85 lakhs. The progressive total of Norwegian expenditure since the inception of the project upto the end of the March, 1959 comes to approximately Rs. 190.55 lakhs. The Indian expenditure during the year amounted to Rs. 4.51 lakhs and the progressive total of Indian expenditure is Rs. 18.33 lakhs.

The revenue realised and remitted during 1958-59 was Rs. 2,72,172.41.

(iii) Government of India's Deep Sea Stations, Cochin and Bombay

During the quarter ending March 1959, the exploratory fishing operations of the Government of India Deep Sea Fishing Station are as follows :—

Name of vessel	Value realised Rs. nP.	No. of days absent from port	Qty. of fish caught Tons-cwt. -lbs.	Catch/days' absence Tons-cwt. -lbs.
<i>Cochin</i>				
M.V. Samudra . . .	10,704.72	54	29— 2— 92	0—10— 89
M.V. Tarpon . . .	11,745.38	57	34— 0— 05	0—12— 66
Ashok & Pratap . . .	25,578.03	41	153—16— 50	3—15— 04
M.L. Durga . . .	19,470.93	53	35—18— 99	0—13— 63
<i>Bombay</i>				
Meera . . .	1,630.68	37	13—15— 12	0— 7— 49
Sagarkanti . . .	3,229.69	45	16—15— 40	0— 7— 51
Bangada . . .	6,438.50	33	28—18— 94	0—17— 61
Sagar Pravasi . . .	5,920.25	55	30— 3—104	0—10—110
Jheenga . . .	3,416.75	23	14— 4— 70	0—12— 42

(iv) The landings of four bull trawlers of New India Fisheries Ltd., Bombay, for the quarter ending March, 1959 are as follows :

Name of the vessel	Period of voyage	No. of days' ab- sent from the port	Quantity caught (Tons)	Catch day's absence (Tons)	Depth fished (In Meters)
Arnalla and Paj . . .	29-12-58 to 10-1-59	13	171	5.46	32—40
	11-1-59 to 23-1-59				
	24-1-59 to 6-2-59	12	62	5.16	34—39
	7-2-59 to 20-2-59	14	72	5.14	33—40
		14	74	5.28	32—40

(1)	(2)	(3)	(4)	(5)	(6)
Arnalla and Paj :— <i>contd.</i>					
	21-2-59 to 6-3-59	14	63	4.5	28—40
	7-3-59 to 21-3-59	15	72	4.8	22—39
	22-3-59 to 5-4-59	14	70	5.0	29—58
Satpati and Pillotan					
	5-1-59 to 16-1-59	12	70	5.83	34—36
	17-1-59 to 30-1-59	14	69	4.92	26—39
	31-1-59 to 13-2-59	14	76	5.42	33—36
	14-2-59 to 27-2-59	14	70	5.0	26—37
	28-2-59 to 13-3-59	14	73	5.21	27—38
	15-3-59 to 28-3-59	14	62	4.44	22—40

(v) The Government of India quick freezing and cold storage plant at Bombay.

During the period January, 1959 to March, 1959 the income realised from (1) sale of ice, (2) hire charges of cold storage accommodation, (3) basket storage of fresh fish, and (4) freezing of fresh fish are as follows :—

Activity	Value realised Rs nP.
(1) Sale of ice (1,003 tons 11 cwt. 60.5 lbs.)	23,282.70
(2) Hire of cold storage accommodation	13,280.00
(3) Basket storage of fresh fish	9,830.12
(4) Freezing of fresh fish	1,859.00

(vi) Progress report of the Madras Fisheries Department for the year 1957-58.

Fisheries Research

Fisheries Research on the various problems were continued at various Stations. At the Marine Biological Station, Tuticorin, studies on the plankton off Tuticorin, biology of Pearl oysters, evolving a new technique for the estimation of oyster population in the Pearl banks, biology and

ecology of chanks & biological studies on the fishes inhabiting the Pearl banks were made. At Cape Comorin Station intensive studies on plankton, investigation of the lobster fishery and compilation of fish landing statistics were attended to. Work on cured fish products, fisheries bye-products, algology, bacteriology, pearl oyster farming and marine fish farming were done at Ennore and Technological Stations at Tuticorin and Cape Comorin.

Experiments on the segregation of carp fry and reduction in mortality, studies on a few selected fishes, effect of manuring on Hydrilla, spawning of Mirror carp, studies on fishing gear, effects of fish poison on fish life, food value of some fresh water fishes, survey of culturable waters and fish culture problems in lakes were conducted at the various Fresh Water Biological Stations.

Two meetings of the State Fisheries Research Council were held. A fresh three-year programme of research was drawn up. In the second meeting the work done at the various Research Stations during the half year was reviewed.

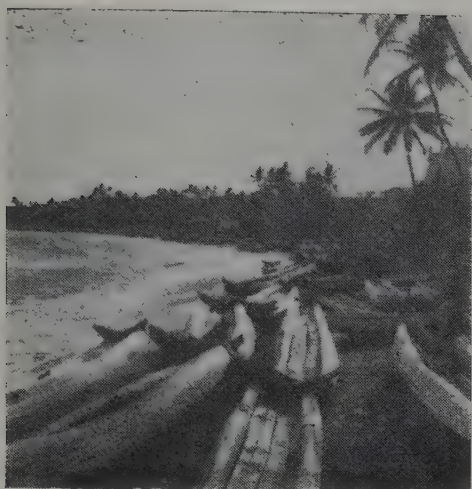
Exploitation of Marine Fisheries

A total quantity of 2,14,76,514 oysters and an income of Rs. 4,65,097.77 was realised as against the target of 214 lakhs of oysters and estimated income of Rs. 451 lakhs. The chank fishery operations in the coastal waters were a successful. During the year a total of 18,37,517 full sized chanks were fished against 12,09,762 during 1956-57. Besides, a lease amount of Rs. 19,786 was realised and an annual rental of Rs. 15,106 will be obtained from chank fisheries.

A total quantity of 5201.41 tons of cured fish was produced in 19 fish curing yards, against 3,062 tons in 1956-57. In all the 21 centres 43,521 lbs. of shark liver were procured and 23,000 lbs. of oil extracted. Popularisation of bye-products, sea weed compost, sea weed ash and semi-dried prawns was also done. A total of 3,000 lbs. of prawns were processed and 490 lbs. of finished product produced. A total of 550 lbs. of miscellaneous fish were processed and about 135 lbs. of fish meal and about 350 lbs of prawn shell meal was produced.

Exploitation of Inland Fisheries

A total number of 8,870 licences were issued for fishing in waters under the Departmental control and Rs. 42,255.12 nP were realised as fees against 42,711 in 1956-57. The revenue realised from the Provincialised waters was Rs. 1,58,418 as against Rs. 1,52,549 during 1956-57. A total quantity of 1,63,752 lbs. of fish worth Rs. 47,987.23 nP was sold to public as against 30,758 lbs. realising Rs. 8,035 in 1956-57. During the year 3,55,000 fingerlings were supplied to 2,100 private parties. Total landings from Mettur Reservoir was about 250 metric tons. Culture of Tilapia was extended to all districts. 25,000 fingerlings of Rohu and Mrigal imported from Calcutta were stocked in selected reservoirs.



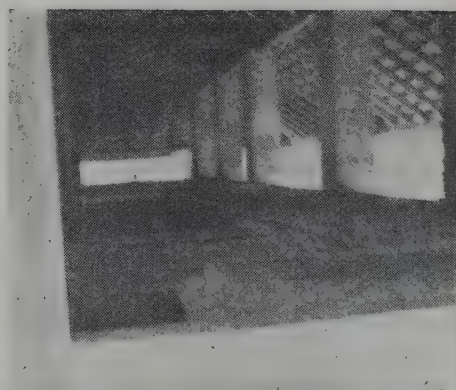
An array of Catamaran at the fish landing place, Cape Comorin.



A view of the beach with a Catamaran which has just landed.



A general view of the Fish Curing Yard.



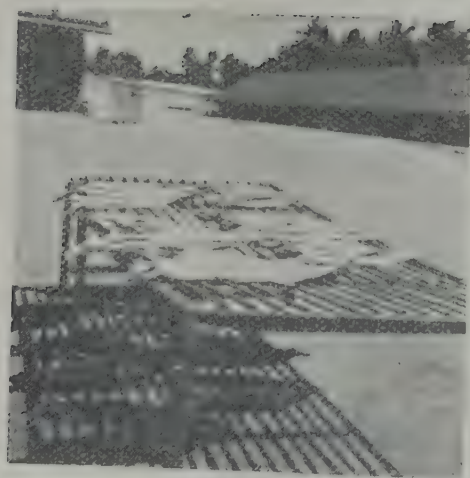
A view of the Curing tubs



Gutting the fish.



Washing the fish.



Drying on the drying platform.



A lorry being loaded with Cured fish.

Statistics

The total production of both sea and inland fish was 1,07,840 tons valued at Rs. 810 lakhs. About 640 tons of fresh fish and 2,000 tons of cured fish were exported to other States in India and 16,860 tons of cured fish were exported to foreign countries. The per capita consumption has risen to 11.3 lbs. as against 10.5 lbs.

A total of Rs. 38,212 were given as subsidy towards fifty per cent of cost for improving fish markets.

Socio-economics

A sum of Rs. 48,000 was sanctioned for the purchase of coir and yarn for supply to fishermen at 50% subsidy. Rehabilitation of 282 displaced fishermen families was completed. The Department continued to maintain the fishery elementary schools. The Adult Literacy Night School continued to function satisfactorily.

General

About fifteen Schemes included in the Second Five Year Plan were pursued during the year with satisfactory results.

The Department availed the services of six foreign experts under the Expanded Technical Assistance Programme. Their programmes included training of fishermen, survey of fishing grounds, improved design of local boats and establishment of boat building yard.

The Government have appointed a technical officer as head of the Fisheries Department, in order to carry out activity with more vigour and undivided attention.

(vii) Survey of the Pearl Banks, Gulf of Mannar (Ceylon).

Since 1925, intermittent surveys were carried out to investigate the possibility of pearl fishery. In 1955 from October 23 to November 3 a dredge survey of the pearl banks of the Gulf of Mannar was conducted and an area of about 110 sq. miles was covered and six Paars were surveyed. The oyster beds were found to be located on West Cheval, True Vankalai, Peria and Twynam's Paars. The majority of oysters collected belonged to the year class of July-August, 1954 and to a lesser extent, to that of July-August, 1955 while it is believed that these oysters will be ripe for harvesting in February, 1958. The total oyster population of the four Paars was estimated at over 213 millions and the value of the pearls collected was found to be approximately 16 cts. per thousand oysters.

(S. Sivalingam—Indian Journal of Fisheries, Vol. V. No. 2, Oct., 1958).

INLAND

(i) Proceedings of the Fisheries Extension Seminar held at the Ministry of Food and Agriculture, New Delhi in December, 1958

A Fisheries Extension Seminar was held at the Ministry of Food and Agriculture, New Delhi in December, 1958 to discuss the scope of fisheries

development in the States and the role of the Fisheries Extension Units in helping such developments. A series of lectures were given by Mr. Charles Wade, T.C.M. Fisheries Extension Expert on (1) Extension, Philosophy and development; (2) Role of Extension on Fisheries; (3) Fisheries Extension Programme in India; and (4) Extension Teaching methods. The following recommendations were made by the seminar in order to improve the activities of the Fisheries Extension Service in India :—

1. Although the programmes of work of the Central Fisheries Extension Units are drawn up in consultation with the State Fisheries Department, a better coordination in the implementation of these programmes is desirable. It is, therefore, recommended that the officers of the Fisheries Extension Units should be available for participation in the discussions in technical matters at meetings and seminars held by the State Fisheries Departments and the National Extension Service Organisations. It is also recommended that this may be brought to the notice of the State Fisheries Departments and the Development Commissioners.
2. The State Fisheries Departments may be requested to send a copy of their technical progress reports to their respective Central Fisheries Extension Units.
3. The monthly and quarterly progress reports should continue to be submitted in the narrative form, but the material should be arranged under various items of activity, along with additional items, as per recent instructions. In addition, the units should submit the above progress reports in a proforma. The reports and proformae should reach the Ministry before the 5th of every month.
4. In order to check up the implementation of the recommendations by the State Governments, the State Fisheries Departments may be requested to return copies of the proformae duly filled in to the Ministry every quarter.
5. With a view to demonstrating effectively the techniques of fish farming, it is recommended that each Unit should have at least one suitable demonstration fish farm under its direct supervision. The Units should put up concrete proposals in this connection in consultation with the State Fisheries Department.
6. Early arrangements should be made to hold Refresher Courses for the staff of the Fisheries Extension Units.
7. For uniformity in collection of data on various aspects of Fisheries, the standard proformae already drawn may be made available to the Fisheries Extension Units so that Village Level Workers and Junior State Officers may be suitably trained to obtain the required information.
8. Quarterly technical reports of the Central Marine, Inland and Technological Research Stations may be made available directly by the stations concerned to the Central Fisheries Extension Units.

9. Any specific problems requiring investigation may be referred by the Extension Units directly to the Research Stations concerned with a copy to the Ministry.

10. Copies of Fisheries Journal should be made available to the Fisheries Extension Units with back numbers if possible.

11. The Chief Research Officer of the Central Research Stations may be asked to furnish copies of accession lists of their libraries to the Fisheries Extension Units and also to permit the Units to borrow books and journals for reference.

12. Tour programmes of the officers of the Fisheries Extension Units should be submitted for approval as early as possible. Copies of the tour programmes should also be sent to the State Directors of Fisheries and the respective officers of the area concerned.

13. To meet the requirements of the Extension Units, 20 copies (English-2, Hindi-10, Tamil-1, Malayalam-1, Bengali-3, Assamese-1, Telugu-1, and Kanarese-1) of the Fisheries films produced by the Ministry of Information and Broadcasting, for the Ministry of Food and Agriculture as also copies of fisheries films from Madhya Pradesh and other sources may be obtained and supplied to the Fisheries Extension Units.

14. The Fisheries Extension Units should prepare suitable pamphlets in local languages on various items of extension activities.

15. The preparation of suitable posters, charts and models for exhibition purposes may be undertaken on a uniform pattern.

16. A model short-term (about two weeks) course for training Village Level Workers and fish farmers in fish cultural practices may be drawn up by the Allahabad Unit and circulated to different Units for their comments and modifications for local adoption after the approval by the Ministry.

17. Extension work in connection with the development of bundh type of tanks in Midnapore and Bankura districts may be taken up by the Fisheries Extension Unit, Calcutta in consultation with the Director of Fisheries, West Bengal.

18. Research problems regarding the spawning of Major Carps in bundh type of tanks may, however, be taken up by the Central Inland Fisheries Research Station in collaboration with the State Government.

19. As some of the Extension Units do not possess any audio-visual equipment, it is recommended that they may be allowed to borrow through the Ministry the audio-visual equipment from the nearest Unit or from the Central Fisheries Research Stations.

20. In view of the paucity of fish seed of Major Carps in Mysore State, it is recommended that the Fisheries Extension Unit, Bangalore should take up the fish culture of Mirror Carp and *Chanos* in suitable areas. Proposals to set up demonstration farms in this connection may be put up in consultation with the State Fisheries Department.

21. The annual programme of work should be drawn up in consultation with the State Fisheries Departments and the Ministry, but each unit may intensify its activities on certain selected items of work or arrears according to the local requirements.

22. In view of the great importance of deep-water fishing in reservoirs, it is recommended that the Central Inland Fisheries Research Station and the State Governments be asked to give a high priority to investigations on devising suitable methods and gear for exploitation of deep waters.

(ii) Report on the contribution made by Central Fisheries Extension Units, Ministry of Food & Agriculture (Department of Agriculture) to the Community and National Extension Service Programme for the quarter ended March, 1959.

Allahabad—36 village tanks in Keraon, Karchhna, Phulpur and Meja Blocks were surveyed and suitable instructions were given to the owners for their improvement. Information regarding improvement of tanks, stocking operations and supply of fish seed at subsidised rates was furnished to B.D.O., Bichpuri and village Panchayats of Urwa Shadow Blocks.

Supply of 20,000 fish seed for Mau Ima and Chail blocks was arranged with the Fish Marketing Officer. Fisheries training was given to 90 V.L.W. and Assistant Development Officers of Training-cum-Extension Project at Bichpuri, 50 V.L.Ws., Panchayat Secretaries and Gram Sevaks at Shankar Garh, 40 V.L.Ws. at Jhusi and 30 A.D.Os. at Chail Blocks.

Film shows and talks were arranged at Fatehpur Sikri, Bichpuri, Chail, Koraon, Sirathu, Shankargarh and Jhusi Blocks and centres.

Block Development Committee meetings at Sarsuon, Shankargarh, Siralthu, Holigarh and other blocks were attended.

Mandapam—Fishermen groups and villagers were contacted at Rameshwaram, Dhanushkodi, Pamban, Sundaramadiyan, Athankarai, Uchipulli, Puthumadam, Muthupettai, Devipatnam, and other centres regarding the improved and hygienic methods of fish curing, neat display and handling of fresh and cured fish, etc. Technical instructions were given in stocking and maintenance of tanks under the Panchayats and Devasthanams in Ramanathapuram district, where Gourami has also been introduced.

Talks were given on Tilapia and Chanos culture to villagers and fishermen groups. Fishery film shows were also arranged in fishing villages. Information were supplied to B.D.Os. of Ramanathapuram district Madras and in Kerala State regarding the technical help available for rural piscicultural programmes. The Unit participated in two fisheries exhibitions in the State.

Hyderabad—Arrangements were made with B.D.Os., Etunagaram Block for taking up fisheries work in village tanks in the area. Discussions were held with Project Officer, Narasapet and B.D.O., Eettunagaram Blocks regarding improvement of village tanks for fish culture. Fishery films were shown before village leaders, Members of Parliament and the public

assembling at Patancheru Block in connection with the annual seminar. A talk on fisheries development was given to the village leaders after the meeting.

Delhi—Instructions were given to V.L.Ws. and B.D.O. of Kanjhawala and Najafgarh Blocks respectively for the collection of data about village tanks on prescribed proformae. 21 tanks in Alipur, Kanjhawala, Najafgarh and Mehrauli Blocks were inspected and necessary technical instructions were given to the owners for the improvement of these tanks for fish culture.

Arrangements were made for the supply of 2,000 fingerlings of carps through the State Fisheries Department to a private tank at Aulambi Khurd in Alipur Block.

A talk on fish culture was given to V.L.Ws. at Kanjhawala Block and the Block Development meetings were attended at Alipur and Kanjhawala centres.

Bhopal—A batch of 40 V.L.Ws. were trained in fisheries at Powerkhada training centre. Film shows were arranged at Silvani in Raisen N.E.S. Block before B.D.Os., V.L.Ws., Village Patels and others assembled in the Block Development Seminar. Film shows and talks were also arranged at Bari N.E.S. Blocks and Shahganj fishing village. Pamphlets on cooperation prepared by the unit were distributed.

Calcutta—Discussions were held with Assistant Development Commissioner, West Bengal, B.D.Os., Domjur and Madhyamgram regarding the plan of work in intensifying extension activities in a few selected block areas. Arrangements were made for holding group discussions on improved methods of fishery development and showing fishery films in villages. Techniques of fish seed packing in oxygenated sealed containers were demonstrated.

The survey of numerous tanks and bheries available in Barasat II Block was undertaken through B.D.O., Sub-Officer and V.L.Ws. of the Block.

Gauhati—Three pisciculturists under Barpeta Road N.E.S. Block were given technical instructions of manuring of stocked tanks for better growth of fish. Talks on fish culture accompanied by fishery film shows were given to Ghagua, Sonapur, Jogobari, Rangiya, Rani and Howly villages under Sonapur, Rangiya, Rani, Barpeta Road and Dimoria N.E.S. Blocks.

Bangalore—Technical guidance was given to B.D.Os., of Nelamangala and Sandur Blocks regarding the breeding operations of Mirror Carps in irrigation wells and temple tanks. Instructions were also given to V.L.Ws. of Shiralkoppa N.E.S. Block about the manuring of fishery ponds.

The syllabus of fisheries training for gramsevak was suitably modified by the introduction of practical demonstrations. At Kudige and Gangavatti Training Centres, 125 gram sevak were given training on fish culture and fisheries development. Fish cultural practices were demonstrated at Munirabad fish farm.

The Unit participated in an exhibition with State Fisheries Department at Ghati Subramanya in Dodallapur N.E.S. Block.

Technology

(i) Progress of work done at the Central Fisheries Technological Research Station, Cochin for the year 1958-59.

A processing wing was organised to undertake investigations on the different methods of fish processing, preparation of fishery bye-products and to formulate standards for quality control of the processed products. In October 1958 a symposium on "Improved types of fishing from small mechanised boats" was organised, followed by an exhibition. The participants of the symposium included besides, State Fishery Officers and Government of India Officers, Foreign experts who are assigned to our country for technical assistance.

The 30 ft. investigational fishing boat, "Fish Tech No. 1" designed by Mr. Ziener was completed and launched for experimental fishing operations with various nets. The second boat is under construction. Several other boats of 6' to 36" length were designed, including "Pram's outboard motor boats for inland fishery work and a 36' fishing boat for marine fishing. Work relating to the marine engines was continued. An advanced course of training in boat designing is under organisation. A programme for tank testing for fishing boats was initiated.

A detailed and systematic survey of the indigenous fishing gear in vogue on S.-W. Coast of India between Cape Comorin and Cochin was initiated. Studies on the designs of trawls and gill nets, the operation of the net making machines and investigations on the relative efficiency of the different types of floats and sinkers were commenced. Proposals for organizing a training course in shrimp trawling from small mechanised boats were formulated in consultation with Dr. Miyamoto, FAO Gear Technologist.

Detailed data regarding the timber fastening and the various preservatives were collected from the boat building yards. Several series of continuous immersion tests on twines of cotton, sunn-hemp, sisal and coir treated with different preservatives were initiated. A study of the dynamic characteristics of the important vegetable fibre twines such as cotton, sunn-hemp, Italian hemp, manila, sisal, coir, etc., was continued so as to suggest improvements in their making as well as to help the selection of the suitable material for a particular gear.

During the year under review, a number of scientific papers were prepared from the craft and gear wing.

(ii) Studies on the preservation of fish by pickling

Pickling, a common method of preserving food, is widely employed for fish curing. Chemical investigation was started to improve the common practices of pickling fishes and to explore the suitability of foreign recipes like Russian Sardine and Marinated Herring for preparing delicious spiced products with vinegar and salt. Sardines, Rainbow sardines and Mackerels

were employed for these experiments and ordinary tamarind was substituted for the Malabar tamarind.

The pickled Mackerel remained in good condition upto 8 months as compared to the wet salted products which deteriorated within 2 months. Smaller varieties of fishes were observed to yield pickled products of longer biological stability and greater consumer appeal. The keeping quality is further improved by incorporating sodium nitrite as a preservation chemical, commercial preparation of high quality pickled and spiced products with Vinegar and salt appears to be a feasible proposition if the methods are modified slightly to suit tropical conditions.

Data from chemical observations collected during storage has confirmed the usefulness of total volatile bases estimation as an index of spoilage in pickled products as well, though the limits for the same may differ from other types of cured products.

(Rao S. V., Valsan A.P. and Nair M.R.—Indian Journal of Fisheries, Vol. V. No. 2, October 1958).

- (iii) Studies on the morality in spawn and fry of Indian major carps during transport.
- (iv) Types of containers used for transporting spawn and fry under oxygen pressure.

For transporting fish seeds "oxygenated containers" described by Hamid Khan (1946) were used but these were not suitable for long distance. In the present article the author has described three types of containers viz. (i) glass carboy, (ii) specially designed aluminium and galvanized iron sheet container and (iii) latex-rubber and plastic bags. In general they were having two holes fitted with rubber corks having glass tubes, through smaller hole oxygen is forced in while the other is for displacement of water. From the point of view of efficiency the aluminium container has been found most suitable but because of its high cost and maintenance latex-rubber bag may be recommended for commercial use.

(K. C. Saha and D. P. Sen—Indian Journal of Fisheries, Vol. V. No. 2, October, 1958).

MARINE FISHERIES RESEARCH

Progress of scientific work of the Central Marine Fisheries Research Station, Mandapam for the year 1958-59

The Central Marine Fisheries Research Station maintained steady progress in its programme of work under the regular and Second Five Year Plan Schemes. During the year the research activities at the existing centres of study were expanded and intensified and new centres for study of off-shore fisheries at Tuticorin and Veraval and Survey Field Centres at Alibagh, Dahamu, Calingapatnam and Colachel were opened as a part of the intensified programme of fish and fisheries survey.

Based on the fisheries survey by this station, the total landings of marine fish during 1958 was estimated at 7.56 lakh metric tons, showing a decrease of about 14% as compared with 1957. There has been considerable decline in the landings in Bombay and reduction in catches in West Bengal, Orissa and Andhra and increase in landings in Madras and Mysore Coasts. The Mackerel fishery was highly successful whereas there was a decline in the Oil Sardine fishery in Kerala and Mysore. The Mackerel, Sardines, Prawns and Bombay duck contributed about 60 per cent of the total fish landings. The catch per man-hour during 1958 was 2.40 kg. The total fishing effort and the catch per unit effort during 1958 was slightly less than 1957.

Fishery Biology

Inshore fisheries investigations on the major shoaling fisheries of Oil Sardine (*Sardinella longiceps*), other Sardines and Mackerel (*Rastrelliger canagurta*) were continued at Karwar, Mangalore, Kozhikode, Cochin, Mandapam, Neendakara, Waltair, Vizhingam and at Porto Novo with reference to collection of information on the general trend of the fisheries at different fishing centres during the year, biological studies on length frequency, percentage distribution in commercial catches, length-weight relationship, sex-ratio, maturity and fecundity, food, growth and production.

Biological studies indicated that Oil Sardine spawns only once a year and the spawning season is not protracted; Mackerel has only one spawning period, with a short time interval in the ripening of successive batch of ova.

Biological investigations on prawn fisheries were carried out at Bombay, Mangalore and Cochin, and general information on the prawn fishery along with data on percentage and species composition, length frequency, sex-ratio, maturity etc. were collected. Studies of the year-class strength, rate of growth, sex-ratio and sexual development of prawns from the trawler catches were carried out through sampling the commercial catches at Bombay.

Statistically designed experiments on paddy-field prawn fishery at Cochin showed that two sluices did not effect any substantial improvement in the yield over one and that the yield from larger field is greater irrespective of the number of sluices.

Experiments on *Tilapia-cum*-prawn culture indicated that *Tilapia* does not feed on prawn fry and its growth is slightly retarded by presence of prawn.

Biological studies on half-beak (*Hemirhamphus spp.*) and Mullet (*Mugil spp.*) fisheries at Mandapam and seer fish (*Scomberomorus guttatus*) at Waltair were continued.

Investigations on the biology of the tuna (*Katsuwonus pelamis*) which form the more important species of Tunnies around Minicoy Island were started. A general survey of the Tuna live bait fishery was carried out because of its importance in the Tuna fisheries programme.

Because of the growing economic importance of the spiny lobster fishery along Kerala Coast, biological observations of the fishery was started.

At the Molluscan Research Unit, Madras, investigations on the effect of transferring seed clams, *Meretrix Casta*, from the Adyar to the Cooum estuary showed that the depleted clam beds could be reclaimed by transplanting young clams when the hydrological conditions in the estuaries are identical.

The off-shore Fisheries Research Unit at Bombay analysed the data of the off-shore Fishing Vessels with regard to the intensity of fishing, composition of fish catches in the different grounds, seasonal variations and catch-per-unit of effort. A similar unit is functioning at Cochin which has just begun the analysis of the data. Such Units will also be established at Tuticorin and Visakhapatnam. The catch per trawling hour by Ashok and Pratap off Cochin was about 1.5 tons.

The off-shore Fisheries Research Station continued fishery biological studies on the commercial important species of Dara, Ghol, Koth, Kar-kara, Shende, Bombay duck and prawns.

Physiology and Marine Fish Farming

At Mandapam experimental studies on the metabolism of *Plotosus* was carried out with interesting results.

The Marine fish ponds at Mandapam yielded a maximum of 220 kg. of fish per hectare. A survey of the ecological characteristics and the fish resources of the nearby coastal lagoons was completed.

Marine Biology

Planktological investigations were continued at Karwar, Mangalore Kozhikode and Mandapam. At Mangalore an exclusive swarm of *Temora turbinata* coincided with the bumper Mackerel Fishery. At Kozhikode the bloom of *Fragilaria oceanica* was not a sustained one and this was partly reflected in the poor Oil Sardine fishery.

At Mandapam investigations on the organic production in the sea was initiated. The study of the plankton at various centres in the Gulf of Mannar and Palk Bay revealed various interesting features.

Oceanographical and hydrological studies were carried out at Bombay, Karwar, Mangalore, Kozhikode and Cochin. Analysis of the data collected at Cochin on physical Oceanography was completed.

Algology

Survey of the harvestable grounds of economic sea weeds in the Gulf of Mannar and study on the distribution of algae in the Pearl beds of Tuticorin have been initiated. Agar prepared from *Gelidium* sp. has been found to be highly suitable for mycological work.

Chemistry and Bacteriology of Fish, Fish Curing and Bye-Products

Investigations on fish curing and bye-products also continued at the station till the first week of December when this work was transferred to the processing wing of the Central Fisheries Technological Research Station, Cochin.

Objective tests for assessing the quality of preserved prawns in ice indicated that storage in ice before processing should be reduced to the shortest possible period so that maximum nutrients are retained.

Experimental studies on the use of shellac as fish preservative gave encouraging results only in small fish; seer fish treated with alginate jelly and stored at 14° F retarded rancidity considerably for 3 months.

A series of experiments were conducted with shark flesh in the study of bacteriological and biochemical changes in fermentation method.

Different aspects of Mackerel curing was studied. Experiments were also conducted to study the beneficial effects of treating cured products with propionic acid.

39 scientific papers were published by the Research Station during the year.

(Central Marine Fisheries Research Station, Mandapam)

Fishery Biology

(i) Notes on Eggs, Larvae and Juveniles of fishes from Indian waters

1. *Xiphias gladius* (Linnaeus)

The swordfish, *Xiphias gladius*, has world-wide distribution, the post larva of which was collected on 28-2-58 thirty miles east of Kalpeni Island in the Laccadives by surface tow net. The article deals with its characteristics and external features, length, fins, etc. This can be easily recognized by elongated snout with spinous ridges and absence of ventral fins. General colour is brown in formalin and there is a general pigmentation of varying intensities all over the body except in the spiny ridges and pectoral fins. The indications are that spawning would have taken place in February towards the north and the larva would have been drifted near the Laccadives. The post larva collected from distant seas shows no significant difference in the important characters.

(S. Jones—Indian Journal of Fisheries—Vol. V, No. 2, October, 1958)

(ii) Observations on Mackerel Fishery at Karwar for the seasons 1954-55 and 1955-56

In the paper the Mackerel Fishery, of Karwar for the Seasons 1954-55 and 1955-56 have been dealt with. The total landings of Mackerel during the two Seasons were 951.2 tons and 508.3 tons respectively, which is much lower from the high peak of 2,250 tons in 1951-52. The occurrence of

'red-water-phenomenon' in October-November in 1955-56 Season resulted in the complete failure of the Mackerel Fishery.

The study of Catch-per-unit of effort classified the Mackerel Season into three phases (i) peak-period of Fishing—October-November (ii) Slack fishing activity—December-January and (iii) Secondary peak period—February-March.

The Size-group of Mackerel caught at different centres with Rampan nets during 1955-56 season showed no marked difference and two different Size-groups *viz.*, 16-18 cms. and 22.5 cms. entered the fishery of the 1955-56 season while only one Size-group of 22.5 cms. constituted the Fishery in the season 1954-55.

Having a view on the price index of Mackerel during the seasons it can be concluded that the Mackerel Fishery during the year 1955-56 season was poor along the North Kanara Coast.

It has been noted that the fluctuations in the Oil Sardine Fishery do not influence the course of Mackerel Fishery. Studies have been initiated at Karwar to see how far the Sardine Fishery is complementary to the Mackerel fishery of the area.

(Radhakrishnan N.—Indian Journal of Fisheries, Vol. V. No. 2, October, 1958).

(iii) On the occurrence of *Anchoviella baganensis* and *A. bataviensis* along the South-east and South-west Coasts of India

Occurrence of *Anchoviella baganensis* (Hardenberg) and *Anchoviella bataviensis* (Hardenberg) is recorded for the first time from Indian waters (from the seas off Trivandrum on the South-west Coast of India and around Mandapam on the South-east coast). Short description of the above two species collected at these centres and notes on the systematics of other Indian forms with a key for identification of *Anchoviella* species so far recorded from Indian waters are given.

(K. C. George—Indian Journal of Fisheries, Vol. V, No. 2, October, 1958).

(iv) The Tuna live-bait Fishery of Minicoy Island

The most common among Tuna live-baits, are of the group Pomacentrids and Caesioidids and found within the lagoons and inshore waters adjacent to the Island. These are caught with nets locally known as 'Nib-mali' made up of coconut stem. The bait used for their catches are crushed crabs. These catches are stored in wells built inside the boats and in 'labari' in cane bait-basket. The method of capture and storage are described and figured. In the article the importance of bait-fish study in any intensified Tuna fishing programme in the Laccadive Archipelago is indicated.

(S. Jones—Indian Journal of Fisheries, Vol. V. No. 2, Oct., 1958)

(v) Notes on the Frigate Mackerels, *Auxis thazard* (Lacepede) and *A. tapeinosoma* Bleeker, from Indian waters.

The frigate Mackerel of the genus, *Auxis*, the smallest of the Tunas, is a widely distributed fish found in all the warm seas. The two species in question also occur in Phillipine waters as shown by Wade (1949). The fish was caught from Minicoy Island in 1954 and also at Vizhingom showing thereby its regular occurrence on the west coast of India.

A complete description of the external characters along with the key for the identification of *A. thazard* from Minicoy and *A. tapeinosoma* from Malpe has been given in the article, the later has been recorded for the first time in India.

Auxis is generally caught in gill-nets. Sometimes they are fished when No. 5 hook is used with *Anchoviella* as the bait. Large catches of this fish were landed at Calicut on 17th October and 24th October, 1956.

Detailed observations on the fish is needed and the recent appearance of *A. tapeinosoma* in large shoals is of special interest.

(Jones S., Indian Journal of Fisheries—Vol. V. No. 1, April, 1958).

(vi) Observations on the spawning season and the Fisheries of the spotted Seer, *Scomberomorus guttatus*

Being a commercially important fish, studies were made which shows that its fishing season starts after the close of the north-east or south-west Monsoon. From ova diameter measurements, it was concluded that the fish spawns during April to July and the spawning season is short and restricted, July being the peak period for spawning. The fully ripe eggs at maximum size measured 1.2 mm. in diameter and having a single oil globule of 0.16 mm. size. The eggs were transparent. Percentage occurrence of mature fish was the highest during May to August with the peak in July. 100% mature fish were found only in and above 48.52 cm. group thereby, showing the minimum size at first maturity. A formula has been given representing the relationship between total and standard lengths.

Scomberomorus guttatus occurs all through the year in the landings on Rameshwaram Island. The summer months (March to Sept.) witness good landings with the peak of the season in March. The catches are poor during the winter months (October to February), reaching the lowest in February. The fishery seems to consist mostly of the third year class.

(B. Krishnamoorthi—Indian Journal of Fisheries—Vol. V. No. 2, October, 1958).

Hydrobiology

(i) An estimation of heat changes in the Bay of Bengal off Visakhapatnam.

An estimate of the heat changes in the Bay of Bengal off Visakhapatnam during three different periods viz., 21st October to 29th October, 1952, 19th February to 4th March, 1953, and 4th March to 17th April, 1953 is made

from the data of oceanographic cruises of the Andhra University, following the methods of Jeung and Gilcrest (1955). During the entire period there is a continuous loss of heat from the Bay and maximum loss of heat occurs at about 10 to 15 miles from the coast. Evaporation, advection and vertical turbulent mixing are supposed to play an important role in the heat changes of the sea off Visakhapatnam during the period under investigation.

(A. A. Ramasastry—Indian Journal of Fisheries—Vol. V. No. 2, October, 1958).

(ii) Observations on the plankton of the Cochin backwaters.

After describing the topography in brief, the author deals with the qualitative aspects of the plankton of Narakkal bunder canal which were studied during the year 1952-53. Quantitative aspects in the second year from March, 1953 to February, 1954 were also studied in order to know the fluctuations in the composition of the plankton. Great similarity in general trends in the time of occurrence, maximo and minima of the different planktonic elements were noticed for the two years.

Hydrological features like salinity and surface temperature were also studied for the two years and their seasonal fluctuations also were found to be of marked similarity for the two years, being very low during monsoon months and very high in the hot months. The seasonal fluctuations in abundance of the various planktonic groups, more especially zooplankton are described and an attempt is made to correlate these fluctuations with fluctuations in the salinity of the water, planktonic elements like medusae *Pleurobrachia globosa*, *Sagitta spp.*, *Stomatopod* larvae, *Lucifer hansenii*, *Eocuma spp.*, etc., are found to show distinct relationship with salinity in their appearance and disappearance in the plankton.

(M.J. George—Indian Journal of Fisheries, Vol. V. No. 2, Oct., 1958).

INLAND FISHERIES RESEARCH

Progress of scientific work of Central Inland Fisheries Research Station, Barrackpore, for the year 1958-59

There was an all round intensification of the research programme during the year. The Krishna-Godavary Fisheries Research Unit was shifted to Rajamundry.

Pond Culture Division

Fish breeding experiments by pituitary hormone injections were carried out successfully at Joysagar in Assam and Cuttack; experiments were most successful with Rohu; percentage of hatching was high during cloudy weather and at low temperature. Little over 10 lakhs of major carp fry were produced at Joysagar showing thereby that the hormone injection technique can profitably be employed for commercial production of quality fish seed at very little expenditure.

A very easy and sure method of indentifying the sexes of mature Major and Medium sized carps has been found out.

The average percentage of survival upto fingerling stage of Rohu produced by hormone injections was over 57%, the maximum survival being 83.4%. By proper nursery management over one lakh Rohu fingerlings were obtained by breeding one pair of Rohu.

Successful results have been obtained generally by injection of 5-6 mgm. dry weight of pituitary gland to a pair of breeders; with smaller fishes, proportionately lower doses are required.

Success has been achieved in stripping carp eggs and artificially fertilizing them.

Experiments on hybridisation of Major Carps have met with immense success and 12 different hybrids have been obtained. This might help in raising new strains of better culturable qualities by selective breeding.

Intensive work carried out on various aspects of biology and propagation of the Common Carp *Cyprinus Carpio* in Indian waters have yielded very valuable information. In 18 months a maximum weight of 8 lbs. and a length of 55 cms. was attained; under identical conditions growth of fingerlings of common carp is far quicker than that of Mrigal, as good as that of Rohu and slower than Catla; fish responds to artificial food; sexual maturity is attained at about 6 months and breeds almost throughout the year; a female fish can spawn at least 4 times a year and lay about 3 to 3½ lakhs of eggs at one spawning; though natural spawning takes place occasionally, the fry and fingerlings produced thereby are very limited in number. Ripe specimens can be easily induced to breed by providing aquatic weeds or vegetable fibres for depositing eggs.

Experiments to show the compatibility or otherwise of *Tilapia* in Carp ponds revealed that *Tilapia* adversely affects the growth and survival of Carps. Experiments on *Tilapia* as a forage fish for Murrel showed that Murrel keeps a complete check on multiplication of *Tilapia* and utilise *Tilapia* as forage.

Experiments on culture of fish in irrigated paddy fields showed that average yield with *Tilapia* was 69 lbs. per acre and 15 lbs per acre with Common Carp; although survival of Common Carp was very low, the survived fish showed remarkable growth.

Weed control investigations were continued with special attention to submerged weeds and effect of Urea on Ottelia, Borax on Hydrilla, organic fertilizers on submerged weeds and causes of mortality of fish. 40 weed infested ponds in Orissa were surveyed taking into consideration the nature of the weeds in relation to the physico-chemical features of the water, soil and other factors.

It has been established that Sodium arsenite kills most submerged weeds thoroughly, the effect of one clearance lasting for 4-6 months.

Observations on the economics of chemical and manual clearance have shown that clearance of submerged weeds by Sodium arsenite is much cheaper than continuous manual clearance, costing Rs. 93 for chemical per acre three feet deep for the former and Rs. 265 per acre for manual dewatering.

About 40 fishery tanks in Orissa and 30 tanks in West Bengal were surveyed to study the soil composition in relation to fish production. Study of the growth of Major Carps under different soil conditions indicated that slightly acidic or alkaline soil and available phosphorus play an important role in determining fish production, while soil Nitrogen had no direct correlation; lime plays an important role in increasing the available soil phosphorus.

Riverine and Lacustrine Division

Fishery investigations in the Ganga river system and estimation of annual fish landings at Sadiapur on River Jamna, Daraganj and Buxar on Ganga was continued.

There was a progressive decline in *Hilsa* fisheries and downward trend in the catches of endemic fisheries over the four years. The possible causes indicated are extreme draught or excessive untimely floods, switch over of profession of fishermen and silting up of fishing grounds.

Biological investigations on the important commercial species *viz.*, Cat fishes, Major Carps and other fish stocks, studies on plankton production and physico-chemical conditions of the Ganga river at four centres were carried out.

A preliminary survey of the fisheries resources of Brahmaputra river system in Assam was undertaken and six districts were surveyed. This survey indicated that (1) the resources of Brahmaputra are being exploited at a level where it appears necessary to implement some conservancy measures, (2) system of leasing of the Government waters is extremely defective and (3) the need for proper organisation of cooperative society of bona fide fishermen.

The Scheme of Ganga survey, Narbada-Tapti survey and Krishna-Godavari survey and the water pollution studies initiated under the second Five Year Plan were continued. 340 miles of Narbada were surveyed and statistics on fishing villages, fishermen population, crafts and gear were collected. Observations on the availability of Major Carp seed in these rivers were also made.

Lacustrine investigations at Tungabhadra Dam and reservoir fisheries were continued. Studies on the fisheries, bottom fauna, plankton and hydrology of Krishnarajasagar have also been started.

Estuarine Division

Investigations on the fisheries of the Hooghly, Matlah and Mahanadi estuaries and sampling survey and total enumeration for estimation of

total catch of the estuaries were continued. The inventory of the fishing Units of the Mahanadi estuary was almost completed.

Regular studies of samples of commercial catches of fishes of the estuaries were carried out to provide the primary data for understanding population characteristics.

Experimental fishing with more effective gear is proposed from the Estuarine Research and Exploratory Fishing vessel recently obtained.

Hydrological observations and qualitative and quantitative analysis of plankton from Hooghly, Rupnarain and Matlah were continued. Studies on the productive potential of brackish water beheries were also continued.

Studies on the maturity, breeding and early development of estuarine palaemonid prawns from Hooghly estuary were continued.

A rapid survey of Pulicat lake with reference to fishermen population, craft and gear etc., and a preliminary survey of Vembanad Lake (Kerala) was carried out. It was estimated that about 10,160 metric tons of prawns are caught annually from Vembanad Lake.

Investigations on the *Hilsa* fisheries indicated that *Hilsa* fisheries were extremely poor during the year excepting Brahmaputra and that quantity of plankton in the Sunderban area is an important factor that determines the success or failure of *Hilsa* fishery.

An inventory of the *Hilsa* fishing Units of the Krishna river was completed and a suitable sampling programme was devised to estimate total catches and catch-per-unit of effort from the river. Sampling surveys of Godavari and Padma with regard to *Hilsa* fishery were conducted.

Training was given to Fisheries Department Officers from Andhra and Assam in Sampling Survey methods for collection of *Hilsa* statistics.

Analysis of the morphometric data to delimit *Hilsa* Population indicated that *Hilsa* of Ganga, Padma, Chilka, Godavary, Cauvery and the Saurashtra Coast can be distinguished from that of the Hooghly and the population of Brahmaputra, Krishna and Narbada and that there is significant difference in the fat content of fish from the different environments.

A suitable method of tagging *Hilsa* was evolved. Recovery of 7.76% was recorded and indicated that the direction of migration of mature *Hilsa* is not always up-river as generally believed. Survey to assess the abundance of young *Hilsa* in the Hooghly was continued.

Chilka Lake Investigation

Investigations on the fisheries of Chilka Lake with special reference to the catch-per-unit of effort by various gear, the species composition of the catches, predominant sizes, and maturity and breeding habits and other biological observations on commercial fishes and hydrological conditions of the lake were continued.

Fish Pathology Investigation

Fish pathology investigations on fish mortality in jute-retting tanks indicated the maximum safe limit of jute charge for each mass of water. Investigations on incidence of isopod parasites on estuarine fishes were taken up. The causes of mortality of fishes in tanks were studied.

Nineteen scientific papers were published during the year.

(Central Inland Fisheries Research Station, Barrackpore)

Fishery Biology

(i) Observations on the spawning of the Major Carps at a fish farm in the Punjab.

The spawning observations were made at the Government fish farm, Batala which is fed by flood water and connected to a small stretch of water, the 'pabban' by a narrow drain. The tank was stocked in 1939 for the first time and the fishes spawned in 1946-47, 1948, 1950 and 1952. Observations reveal that high oxygen tension and increased pH value are not required for fish breeding. It has also been noticed that chemical composition of water undergoes no appreciable change during fish breeding and that the chemical nature of water has nothing to do with breeding. However, presence of flood water in appreciable quantity in the breeding ground and a current of moderate intensity are pre-requisite for spawning.

(D. V. Khanna—Indian Journal of Fisheries, Vol. V. No. 2, Oct., 1958).

(ii) Biology of the Hilsa, *Hilsa ilisha* (Hamilton) of the river Hooghly.

The present investigation is based on observations conducted at four sampling points on a 65 mile stretch of river Hooghly. In the beginning the main ecological features of the river are mentioned.

There is no significant difference between the length-weight relationships of male and female fish, but the length-weight relationship of immature fish is significantly different from that of adults.

The gonad weight-body weight ratio shows high values during the breeding season. The fluctuations in relative condition values provide supporting evidence regarding the spawning season and are greatly influenced by the gonad weight. The relation of fecundity of *Hilsa* to its body weight is linear and the relation between fecundity and length is exponential.

There are two spawning seasons, one during Monsoon upto November and other during winter from January to February. Individual fish spawns several times during a spawning season. It is inferred that *Hilsa*

does not spawn below Baghbazar area in Hooghly. The $1\frac{1}{2}$ years old fish which ascend the river in winter have attained the maturity for the first time. The Monsoon run consists of fish of higher age-groups also.

The males mature when they are 16 to 17 cms. and females when 19 to 20 cms. in total length but there is no evidence that males mature earlier than females in spawning season. The growth rate and the maximum observed size of the two sexes are significantly different.

In Monsoon run the sex ratio remains 1 : 1 but there is a predominance of males in the winter samples attributable to selective fishing.

Hilsa scales do not indicate the growth. By length frequency it has been found out that males attain lengths of 24.7 cms., 34.3 cms., 39.3 cms., and females 26.5 cms., 39.1 cms., and 43.6 cms., in $1\frac{1}{2}$, $2\frac{1}{2}$ and $3\frac{1}{2}$ years respectively.

It is concluded that *Hilsa* ascend rivers only for spawning and that the spent fish as well as their progeny migrate down the river. It appears that lower estuaries and coastal areas form the habitate of the species. The factors that induce the migration are discussed.

The results of collection and rearing of *Hilsa* show that culture and tagging of *Hilsa* may be feasible.

Hilsa fishing methods are briefly described and the annual landing from Hooghly is about 40,000 mds.

(T.V.R. Pillay, Indian Journal of Fisheries, Vol. V. No. 2, October, 1958).

(iii) Destruction of Major Carp fingerlings in a section of River Ganga and its probable adverse effects on Fish Production.

A 130 mile stretch of the river Ganga extending from Patna to Mughal-sarai was surveyed in appropriate seasons during the years 1952, 1953 and 1954 with a view to studying the intensity of the Carp fingerling fishery rampant towards the beginning of autumn. Catches of Carp fingerlings have been estimated species-wise and mortalities between fingerling and yearling stages of each species involved have been determined from the catch data. Taking into account the combined natural and fishing mortalities obtaining in the fish stocks, the anticipated gain in the yield in terms of fish flesh and cash value, which would accrue through appropriate legislative measures to ban capture of Carp juveniles has been estimated. The propriety of such measures is also discussed.

(Jhingran V. G. and Chakraborty R. D.—Indian Journal of Fisheries Vol. V. No. 2, October, 1958).

FOREIGN

GENERAL AND DEVELOPMENT

Marine

(i) Fishery industry in Pakistan

A Fish harbour has been set up in Karachi, with the aid of I.C.A. and Rockefeller Foundation. The President of Pakistan, at the same time, promulgated an Ordinance in terms of which the wholesale transaction in fish will take place only at the fish market at the Karachi Fish Harbour. The transaction will be through auctions through such fish marketing organisation or organisations as may be set up with the approval of the Central Government. In this connection the following information on the export of fish may be of interest.

West Pakistan has in all 14 fish villages with a population of 3,90,000. The number of active fishermen is reported to be 13,000 possessing 1,048 fishing boats and 80 launches.

The production of fish in Pakistan was as under:—

	Metric Tons
1955	270,985
1956	277,150
1957	282,800
1958	283,700

Pakistan exported fish during the last three years as under :—

		1956	1957	1958
1. Cured and processed	Quantity	537,452	482,668	472,273
	Value	251,24,510	254,02,951	23,444,433
2. Fish meal and manure	Quantity	52,220	185,201	56,188
	Value	1,061,384	1,094,133	1,081,309
3. Fish frozen	Quantity	1,214	4,557	3,616
	Value	2,393,40	849,484	849,433
4. Canned fish	Quantity	145	1,894	2,233
	Value	328,967	—	219,701

[First Secretary (Commercial), Indian High Commission, Karachi].

(ii) Lower Landings of fresh fish in September 1958 in Hong Kong

Bad weather during the month of September adversely affected fishing operations and total landings were some 20% less than those of the

previous month, according to the report of the Director of Marketing. A general reduction in fishing activities was also caused by the Mid-Autumn Festival celebrations at the end of the fishing season for purseseiners and heralds the beginning of the main season for trawlers and liners.

Landings of marine fish totalled 36,595 piculs as against 45,457 piculs in August. Shark interference at the fishing grounds as reported by some long liner fishermen, but the damage caused was not serious. The decreased landings were reflected in increased prices and the average price in September was 61 cents per catty as compared with 50 cents per catty in August.

The report further adds that production of salt dried fish was also affected by poor weather conditions and landings were some 18 per cent less than those of August. The lower production was also reflected in higher prices, the average wholesale price being 35 cents per catty as against 33 cents per catty in August.

Sales of salt dried fish in September amounted to 4.804 piculs as compared with 5.848 piculs in the preceeding month.

(iii) News England Commercial Bluefin Tuna Purse Seining—1958 season

It was estimated that unsuccessful sets were made approximately 162 tons of Tuna during the entire period for one or more of the following reasons: fish under bottom of net, seine line hang up, net ripped in mud, fish wild, ripped bag due to load, snarled seine while setting.

A number of factors must be taken into consideration when attempting to evaluate the future prospects of this type of fishing in the New England area. During the 1958 season, Schooling bluefin Tuna appeared late, in August, approximately one month later than normal. This tendency for a later season was the characteristic pattern of other surface, schooling species of fish in the new England area. Fishermen familiar with the area reported that the abundance of schooling Tuna was below that normally expected. The size of most Tuna caught during the 1958 season ranged from about 60 to 80 pounds per fish. Records indicate that adverse weather conditions (wind, storms, etc.) in New England were most numerous than usual, and this reduced the periods when purseseining could be done successfully. Other factors which tended to reduce operating efficiency were (1) the aged condition of the net which required excessive periods of repair, and (2) a crew most of whom were inexperienced in purseseine fishing for Bluefin Tuna.

Industry estimates indicate that the 1958 Tuna season could have yielded at least 250 tons with adequate gear, training and assistance by aerial spotting.

The extent of commercial Bluefin Tuna resource, both inshore and offshore, available to the New England Fishing Industry is yet to be thoroughly evaluated.

However, a fishery contributing substantially to the New England area can be developed with proper fishing methods. This has been demonstrated in previous years by other vessels and is again emphasized by the record production of the silver mink.

(Squine J. L.—Commercial Fisheries Review—February, 1959, pp. 1—4).

(iv) Norway fishery landing down in 1958

The 1958 Norwegian fishery landings of 12,15,000 metric tons (about 2.7 billion pounds) were the lowest since 1949 and down about 7,70,000 tons from the record catch of 1956, according to figures released by the Norwegian Directorate of Fisheries. The value of the landings in 1958 was estimated at about 56,57,00,000 kroner (\$79.2 million). The drop in landings for 1958 was due almost entirely to the failure of the winter Herring fisheries which yielded only 3,45,000 tons as compared with about 8,00,000 tons in 1957 and over 11,00,000 tons in 1956.

(Commercial Fisheries Review—March, 1959, page 84)

(v) British Columbia 1958 Herring catch sets record

British Columbia's 1958 fall Herring catch was of record proportions. By December, 1958, 1,50,000 tons had been taken, an all-time record. Herring catches from 1954-57 averaged about 52,000 tons. The Fisheries Association of British Columbia attributed this record Herring catch to good spawning and ocean conditions, as well as to wise management and conservation policies.

It is stated that most of the Herring catch is converted into fish meal and oil.

(Commercial Fisheries Review, Vol. 21, No. 3, March, 1959, page 60).

Inland

(i) Great lakes fisheries

In the report of international Great Lakes Fishery Commission, it was pointed out that the convention between Canada and the United States for the conservation of Great Lakes fishery resources noted the interrelationship of fishery conservation problems, the decline of some of the Great Lake fisheries, and the desirability of advancing fishery research. The Commission was established with two main responsibilities: (1) to formulate research programmes which would determine the measures necessary in order to make possible the maximum sustained productivity of any stock of fish and (2) to formulate and implement a programme to eradicate or effectively control sea lamprey populations in the Great Lakes.

The annual yield from Great Lakes is approximately one hundred million lbs. of fish worth sixteen million dollars. However, this too is not the total production of Lakes as the sport fishing catch cannot be established with factual harvest data and the commission is interested in the development of a healthy sport fishery. The Great Lakes also contain

abundance of certain species which are not profitably taken by conventional gear now in use and the real interest lies in the utilization of these stocks. Besides these, the shallow water fisheries are the most productive of all the lakes.

(Trade News—December, 1958)

Technology

(i) **Composition and nutritive value of Fish preserved under different conditions: Salted and dried African Samples, commercial fish meal and NUOC mam**

The nutritive value of 14 African fishes salted and dried in the sun in the native Angolan manner was compared with that of herrings and haddocks preserved by modern techniques such as fish meal and of abobi, a fish from Togoland preserved by drying whole, and *Nuoc mam* a fish product from Viet-Nam. The average contents for the Angolan Samples were: moisture 16.8, protein 56.1, ash 25.4, total 8.96 and lipoids 4.82g/100g., fresh weight corresponding values were for herring meal 8.5, 75.5, 10.2, 12.1 and 17.05 haddock meal 12.5, 76.8, 4.9, 12.3, and 7.75, *abobi* 7.0, 61.9, 22.2, 9.9 and 4.35, and *NUOC mam* 65.0, 10.8, 22.4 and 1.72. The amino acid content of the Angolan fish varied considerably but did not seem to be effected by the method of preservation used, the low ammonia N, content being proof of non-alteration, Maximum content of leucine, lysine, methionine, threonine and valine were equal to those of eggs, but those of cystine, isoleucine, and phenylalanine were lower. Desiccation losses in the Angolan fish were vitamin B₁, 50%; riboflavin, 80%; nicotinic acid, 15%; and B₁₂, 30%. The loss of riboflavin is serious since African diets are already low in that vitamin. The herring and haddock fish meals showed an extreme deficiency of vitamin B₁ and vitamin B₁₂ respectively. *Nuoc mam* was very low in both these vitamins. The possibility of improving the low protein African diet by a supplement of preserved fish was examined. Results showed that when 5% of the Angolan fish was added to a basal low protein diet of white flour, ground nut oil and lucerne meal, it produced for greater weight gain in rats than did similar supplements of casein, *abobi*, fish meal or *Nuoc mam*. The ration was, however, still not adequate in protein. The Angolan method of preserving fish can be recommended for use in other African fishing regions, but fish thus treated must not be fatty otherwise oxidation of the lipids makes them unfit for human consumption.

(World Fisheries Abstracts, Nov./Dec., 1958, p 33).

(ii) **Bisulphite Tests to prevent Black Spot**

Results from the present series of tests show that a single, one minute dip in a 1¼% Sodium bisulphite sea water solution, applied immediately after the heading and washing operations, affords good protection against the formation of black spot for the first 10 days of iced storage. It is during this period when the shrimp are held in ice and before they are frozen or processed, that the prevention of black spot is important. Increasing the length of the dip to 15 minutes extended the effectiveness throughout the entire storage period. Although longer dipping times

and higher concentrations resulted in an even lower incidence of black spot, there may be a possibility of imparting a chemical taste to the shrimp.

Taste panel judgements indicated a slight improvement in the odour of shrimp treated with Sodium bisulphite compared to the non-treated controls. It has also been indicated that the treatment had no effect on the texture of the shrimp. Sulphur dioxide residuals in shrimp treated with all concentrations of Sodium bisulphite tested remained less than 10.10 p.p.m far below the values found in dried fruits. The tests also revealed no evidence of destruction of thiamine. It is reported that by adoption of this procedure, about 85 per cent of the catch could be landed in "pearl" condition. Full benefits from the use of the chemical may not be obtained unless quick and careful handling procedures are followed. Using too much of the chemical or dipping the shrimp too long in the Sodium bisulphite solution may cause a slight sharp or acid taste.

(Fisheries Newsletter, August, 1958, page 11)

(iii) Shell Fishing Techniques

The age-old skin diving technique of the Red Sea commercial Trochus shell fisheries, which often results in deafness, impaired vision, embolism, cramps and other physical disability of the divers, is being replaced by the introduction of simple modern diving equipment.

The equipment, consisting of face masks, snorkels, flippers, and hand powered pump and hose units, is being introduced by William Reed, an Australian Sea Shell fishing expert of the Food and Agriculture Organization of the United Nations, Rome, Italy, who recently organised a Diving Training course in Dongobab in Sudan.

The equipment will not only help eliminate the occupational diseases of the skin divers but it will also enable them to fish more Trochus and mother-of-pearl shells. One recent test showed that a diver using the equipment collected more Shells in 15 minutes than an unequipped skin diver can collect in a whole day's work the equipment enables divers to stay under-water-longer, more freely over a wider area of the sea-bed and work safely in deeper waters where there are untouched Trochus and mother-of-pearl shell beds.

(Trade News—Dec., 1958, p. 15)

(iv) Economic method of packaging

A method of packaging frozen fish, which involves the manufacture of polyethylene as used and is said to extend greatly the storage life of the product, has been patented in the United States. The new method works as follows :—

The frozen product passes on a conveyor belt from the freezer directly to a polyethylene extruder, which has a special exhaustor which covers the product with a polyethylene film produced at the instant of wrapping. The product can continue on the same belt directly to the storage room. Due to the enormous difference in temperature between the polyethylene

film, which is produced at a temperature of 356 °F, and the frozen product, which has a temperature of minus 22 °F, the heat of the polyethylene has the effect of destroying a good deal of surface bacteria, without damaging the product, since this difference in temperature exists for only a fraction of a second. As the product is passed out of extruder, the air is evacuated from the polythylene tube which is heat sealed at both ends. Because of the characteristics of polythylene, the object appears as a glazed polythylene inclusion. It is reported that this has the same effect as perfect glazing without any risk that this seal can become diminished by the influence of air or freezing. In addition, there are the advantages inherent in having the product polyethylene enclosed. This method of packaging can cut down investment tied up in a variety of sizes of packing.

(Fisheries Newsletter—September, 1958, p. 13)

Trade

(i) Japanese canned fish for Burma

Japan has agreed to make a reparations payment in the form of consumer goods, namely canned fish worth 630,000 dollars to Burma, which is the first case of its kind. This supply is, however, understood to be on condition that Burma will purchase 980,000 dollars worth of canned fish from Japan and other countries.

(ii) Norway-Czechoslovakia Trade Agreement for 1959 includes Fishery products.

Norway and Czechoslovakia agreed to continue into form until December 1959, the basic trade agreement of March 1947. New Commodity lists were agreed to during the negotiations in Oslo. Norwegian exports to Czechoslovakia will include, among other products, the following fishery products:—

(1) Fish oils, refined and technical, 6,000 metric tons, (2) Medicinal cold-liver oil, 800 tons; (3) Fresh frozen, and salted herring, 14,000 tons; (4) fish fillets, 2,500 tons; (5) other fish, including Mackerel and Tuna, 1,000 tons; (6) canned fish, value 3,000,000 kroner (US \$ 420,000); (7) fish meal, 2,000 tons; and (8) pearl essence, value 1,000,000 Kroner (US \$ 140,000).

(Commercial Fisheries Review—March 1959, page 58)

(iii) Purchase arrangements for fish in Ceylon

Until the middle of last year the cooperative fish sales Union purchased fish from member societies at fixed prices. Quite often these prices were higher than those received by the Union on the sale of this fish with the result that the Union suffered a loss on this activity. The present scheme is that the Union handles the sale of fish produced by member societies and charges a commission of 15% for this service. The societies can specify minimum price below which their produce should not be sold but should be kept in storage until prices improve suitably. The producer

has to bear freezing and storage charges which amounts to 0.08 cts. a pound for the first month and 0.03 cts. a pound for each subsequent months. For instance, Seer shipped from a society in the south has been held for two months because the price of Rs. 2 demanded by the society is not always obtained. It should be possible to dispose of this fish in the near future as the price of Seer is expected to rise.

Conservation and Management

(i) International Fishing Convention

The British Government have reviewed the position arising from the actions of the Governments of Norway and the Netherlands in giving notices of withdrawal from the International Whaling Convention on 30th June this year for the 1959/60 Whaling Season, if agreement is not previously reached upon the allocation, as recommended by the London Whaling Conference of November last, of the Antarctic Catch authorised under the convention.

The Government after considering seriously have decided that the objectives of proper conservation of the Whale stocks and the rational conduct of Antarctic Whaling would best be served if the Government remains party to the convention while striving to bring the recommendation of the London Whaling Conference into effect. The convention is the most satisfactory instrument for ensuring proper conservation and the recommendations of the London Whaling Conference should provide the best means of securing the rational conduct of Antarctic Whaling as between the industries of the several participating countries.

If the recommendations should not be put into effect the Government would consider whether the convention would remain workable. If the position should be reached that a convention no longer fully representative of the Antarctic Whaling countries was failing to secure the conservation of the Whale stocks, and at the same time the necessary conditions for the rational conduct of the industry could not be provided, there must be serious doubt whether the Government would remain a party to the Convention. Furthermore, their attitude to any alternative in the arrangements for the regulation of whaling under the Convention that may mean time be proposed, will necessarily be governed by the need to avoid prejudice to the position of the British Whaling Fleets in comparison with any others that might be operating free of the Convention.

(Press notice—Ministry of Agriculture, Fisheries & Food—29th January, 1959—MAFF 43/59)

MARINE FISHERIES RESEARCH

Fishery Biology

(i) Variations in the incidence of larval Nematodes in Atlantic Cod Fillets along the Southern Canadian Mainland

The incidence (which is of considerable economic importance in Canada) of larval Nematode, *Porrocaecum decipiens* in fillets of Atlantic

Steak Cod, were studied. There is considerable geographical variations of the incidence with only 6% in Market Cod from Novo Scotia off-shore waters and with 35 to 91 per cent in Market Cod from S. W. Gulf of St. Lawrence. Market Cod from W. Novo Scotia and cape Breton Islands, showed incidences of 14 to 22%. The larval incidences in Scrod and Steak Cod were similar. The geographical differences are mainly related to the distribution of Harbour seal (*Phoca vitulina*), Harp seal (*Phoca groenlandica*) and Gray seal (*Halichoerus grypus*) which are the final hosts for these parasites. Highest rate of infection occurred in the smallest fish. In addition to the broad geographical variations, these were local variations which were distinct and Cod taken nearest to the shore had the highest incidence of Nematodes. Annual fluctuations with seasonal variations are also considerable.

(World Fisheries Abstract—November/December, 1958, p. 25).

(ii) Food as a factor affecting the growth of Coho Salmon off the East and West Coast of Vancouver Island, B.C.

The Coho Salmon caught off the East Coast of Vancouver Island are from 2 to 5 inches shorter than those caught off the West Coast and Cohos from both areas increase in length as the summer progresses. The food of Cohos of East Coast comprises of crustaceans throughout summer and juvenile Herring during May & June while on the West Coast the Coho relishes large Herrings throughout summer and few crustacea were also eaten. The comparable data of several years also show the preponderance of crustacea in the diet of East Coast Coho as opposed to those off the West Coast, where the chief item of food was fish. It is also indicated that amount of food eaten by Coho off the East Coast is less than half that eaten by those of West Coast.

There are oceanographic differences between East and West Coast of Vancouver Island which produces a difference in both quality and quantity of food available for Coho Salmon, thus the different feeding conditions causes the less growth of Coho Salmon off the East Coast.

(Prakash A. and Milne D.I.—Progress reports of the Pacific Coast Stations FRB Canada No. 112 Dec., 1958).

(iii) Steroid Hormones in migrating Sockeye Salmon

The importance of Steroid Hormones in the regulation of body chemistry is under study by Dr. D. R. Idler at the Vancouver Technological Station. It is known that Cortical is the major steroid hormone in human blood. Examination of some 150 Stuart Lake Sockeye migrants at different stages of sexual development has shown its concentration 3 times in female blood (plasma) than that in males, while the fish are in river but decreases to 1.5 times on the approach of spawning grounds. Female blood levels are 3 to 4 times those found in normal human blood which is of interest in view of recent reports from Stanford University concerning the enlargements of the adrenal gland in mature Pacific Salmon and its suggested relationship to the deterioration of body structure.

Large volumes of blood have been obtained from Adams river Sockeye before and after spawning, and a complete report on the steroid hormones in Salmon blood is anticipated in near future.

(Progress report of Pacific Coast Station FRB. Canada No. 112, December, 1958).

(iv) Antibiotic used on Antarctic Whales

To ensure sufficient supplies for the rest of the season tests of an antibiotic for preserving whales until they are processed were carried out and found successful. The antibiotic is a British preparation of Oxytetracycline marketed under the trade name of Biostat. It is reported that the oil yield from injected whales was increased by upto 25% and the rapid diffusion of the antibiotic through the whale tissues so delayed the onset of decomposition that the yield of oil of high grade standard was increased by half in many cases. Tests also showed that decay had not begun 48 hours after the whale had been killed, and there was no trace of antibiotic. The quantity of antibiotic necessary for whales was calculated from known results with fish and poultry as being 55 grams.

The Biostat is added in prescribed proportions to a tank of fresh water on deck. The antibiotic is pumped into the peritoneal cavity of the whale as soon as it has been shot. Another method of high advantage is that the antibiotic charge is secured to the harpoon head, so that the kill and the injection are simultaneous. The object is to inject a living whale and so achieve quicker absorption and diffusion of the antibiotic throughout the whale tissue.

(Fisheries Newsletter—July, 1957, page 21).

Fishing Gear & Craft

(i) Sounder apparatus towed by 'Copter.

It is reported that experiments have proved that fish shoals can be tracked and sized with an echo-sounder connected to apparatus towed through the water by a helicopter, but its practicability on commercial scale is yet to be seen.

To obtain an underwater reading equivalent to that obtained from ship borne equipment. special bomb shaped submarine gear was designed to be suspended to 20 ft. from the helicopter and towed through the water at a speed upto 50 knots. Trials also established that underwater noise resulting from the down beat of the rotors on the surface of the water does not affect the echo characteristics shown on the screen. The tests also proved that noise arising from the towing of the apparatus through the water at a convenient cruising speed presents no major problems.

The report also points that a helicopter could conduct a high speed search of a large area of water, but are expensive to operate. Such a service would be economical only if supported by a large number of fishing boats. Moreover, it would have to be used in conjunction with, and not as an alternative to, the boats' own echo-sounders. For, however, accurate

the position fix might be, navigational errors and the movement of shoals would necessitate a final check by a fishing skipper on reaching an indicated spot.

(Fisheries Newsletter—November, 1957, page 27).

(ii) Tests Prove Efficiency of Nylon Propellers

Tests with nylon propeller were made in Denmark and it has been found that for propellers over 18 in. in diameter the expense of the pressure mould was such that it paid to manufacture a propeller head of bronze, and insert movable blades of nylon. These propellers gave, in addition to the strength of nylon, the following advantages:—

(a) Gravitation-free surfaces; (b) lower friction between blade and water; (c) complete absence of electrolysis damage.

A 54 in. nylon propeller fitted to a 45 ton trawler, equipped with a 150 h.p. Hundested semi-diesel engine turning the propeller at 300 r.p.m. has worked out very well. The deformation of nylon under use has been found to be satisfactory. It has also been verified that all the lines of propeller are exactly as when the blades were manufactured. It was also seen that nylon propeller was more efficient than its bronze equivalent, despite the extra thickness. The reason can only be that friction between nylon and water is less than between bronze and water. The difference in weight between bronze and nylon is also important. A typical propeller for a North Sea trawler has blades that weigh over 100 lbs. when made in bronze; the same blade in nylon weigh barely 18 lbs. This difference in weight will have an important bearing on the life of the clutch and stern bearing, and should extend the life of both. The shock load on the clutch will be much lighter with nylon.

In addition, a stranding or sudden blow to the propeller will be partially absorbed by the slight flexibility of the nylon blades, and much less shock will be transmitted to the engines and propeller shaft. Further, this light weight and slight flexibility, combined with the ability to absorb shock, will dampen any critical vibration which may be found in propeller shaft.

(Fisheries Newsletter—January, 1959, page 19).

(iii) Mechanized boats in Ceylon

The first mechanized "vallam" to be built at Point Pedro is now under construction. This will be a large 'vallam', 40 ft. long and 7 ft. wide, and will be fitted with a 30 h.p. Lister Diesel Engine. The 'vallam' will mainly be used for fishing on the Pedro Banks.

Two modern mechanized fishing boats are in the final stages of construction at Ederamulla. These boats are being constructed by Messrs. G. P. Gunawardena and C. Graff. The boats were designed by Mr. Graff, and are 26 ft. long with a beam of 8 ft. and a load capacity of $1\frac{3}{4}$ tons. One will be fitted with a Lister Diesel Engine while the other will have Yanmar Diesel Engine. The production of more boats of this type, as well as of larger boats is planned by the builders for the near future.

(iv) **New Winch-head should reduce Otter Trawl risk**

Operational methods used to handle the heavy fishing gear employed in the otter trawl fishery have remained practically unchanged since the introduction of this fishery to the New England area in 1905. Improvements in trawler construction and design, and more efficient propulsion machinery, and navigational aids and fishing equipment have progressed steadily, while trawl net setting and hauling operations on board and off-shore trawling fleet of today differ but slightly from those performed by the fishing crew over the past 30 years. In an effort to eliminate manual handling of wire cables, the U.S. Bureau of Commercial Fisheries recently installed a new type of winch-head on board.

Records indicate that many serious accidents occur at the winch-head when fishermen are using the messenger wire or fish tackle to "hook up" the towing cables or hoist inboard the fish catch in the cod-end of the trawl. Both operations entail wrapping the wire around a revolving winch-head with the friction of the wire on the drum producing the power point for the lifting operation. Depending on the weight and strain involved, from 4 to 7 complete turns of the wire are needed to hook up the wires or hoist the fish bag. Even under ideal weather conditions, performance of these tasks are considered dangerous. Fabrication of the new winch-head was installed on the board. The inner drum of the winch is flange protected to guard against excessive wire built up, with a holding stud fitted up into the centre of the drum for attaching the eye splice in the end of the wire. It was found during testing that both operations were handled speedily and smoothly on the new drum without manual guidance of the wires.

Application of the device is limited at present to boats equipped with trawling winches capable of reversing action. Because of the difficulty in removing the wire from the drum of the winch must be reversed unless sufficient slack is present to allow the wire to be slipped off the drum. Modifications are indicated before the device can be adapted for use on boats with non-reversible winches.

(Fisheries Newsletter—February, 1959, page 25).

(v) **Bubble wall fish Guide**

Experiments have indicated that a 'wall' of air bubbles may become an important tool for the fishing industry. The air wall was used to guide Herring schools into or away from specified areas. The wall of air bubbles is produced by placing perforated plastic hose along the bottom of the sea and supplying air from a compressor aboard the research vessel.

Trials showed that a school of Herring coming up to the air wall flattens along the wall and refuses to penetrate it. Some of the Herring find their way around the end of the barrier and proceed along their way. Some of the tests were unsuccessful, because the Herring veered away before

coming close to the air bubbles, either frightened by the noise of the compressor or shifting course for some other reason. Efforts to 'herd' Herring into a pocket have been successful only to a degree. The fish retreat ahead of the air wall until a certain concentration of numbers is reached and then they break through.

Experiments will be continued to determine more accurately the conditions under which the use of the air wall can be of most practical value to the commercial fishing industry and to solve some mechanical problems.

(Fisheries Newsletter—January, 1958, page 27).

(vi) Progress in Ceylon

Progress in the mechanisation of fishing boats in Ceylon and in the introduction of nylon nets are the highlights in a summary report sent to the Ceylon Government by the Food & Agriculture Organisation (FAO). The report follows the completion of the assignment of an FAO master fisherman, Mr. J. Saemundsson from Iceland. Among the facts brought out are :—While there were no mechanised fishing boats in Ceylon when FAO'S experts began their work in 1951, there are now about 50; bottom set nylon gill nets and nylon drift nets have been introduced with considerable success, a productive trawling ground has been found at Adam's Bridge; multiple trolling with artificial lures has been successfully demonstrated, and experimental purse seining has showed that there are plenty of fish in Palk Bay.

(Fisheries Newsletter—January, 1958).

(vii) Research by Submarine

The Soviet Navy has made a submarine available for use by the Sea Fishing and oceanography Research Institute. It is anticipated that a submarine will provide much better facilities for underwater and sea bed research than any kind of bathysphere or diving bell. Port holes and searchlights are being installed in the bows. There will be facilities for underwater photography and T. V. recording. Among the instruments being installed are a number of unique ones, such as a remote thermosalt meter with an electronic indicator designed by the Institute's staff. This will enable several readings per minute of the salt content and temperature of the water irrespective of the submarine's speed and depth. The scientists will be able to take samples of the water and of the sea bed, to determine the oxygen content of the water at various depths, and to check the direction, speed and temperature of underwater currents.

On contacting a shoal of fish, it will be possible to accompany it for a considerable period and photograph reactions. It is also the intention of the scientists to take underwater films of the use of various types of nets and gear.

(Fisheries Newsletter—September, 1958, page 27).

FISH PRESERVATION

REFRIGERATION

(i) Preservation in Jelly

The new Norwegian method of freezing fish in alginate has since been adopted by an increasing number of plants. The main advantages claimed are the prevention of dehydration and of rancidity, especially in fatty fish. Freezing time is decreased by 20% to 25%, and packing costs reduced. The process is applied not only to Herrings, Sardines and Mackerel, but also to whale meat, which is sold in 1 lb. consumer packages, and to shrimp. A special alginate powder is used for making the jelly in which frozen shrimp is packed. The jelly prevents drying up, toughening and discolouration and can easily be washed off when the shrimp is thawed.

(Fisheries Newsletter—February, 1959).

(ii) British Railways using new frozen food containers

Because of its flat base, the new type of refrigerated containers designed by the British Railways can be loaded into a sideless wagon or lorry and, therefore, may travel from the railways siding to its actual destination. The containers are made of timber and lined with plymax, a metal-faced plywood sheet. The container known as the A.F. container, measures externally $7 \times 7\frac{1}{2} \times 8'$ high (2.13x2.28x2.44m.) and the insulated walls and roof and floor have a minimum thickness of 9" (22.8). The internal dimensions are $5' 11" \times 5' 5" \times 6' 3"$ (1.80x1.65x1.91m.) giving 193 cu. ft. (5.46 m) of space and a capacity of 3 tons. The tare weight of the container is $1 \frac{4}{5}$ tons. The insulating material is of the expanded rubber type. The plymax sheets consist of plywood sheets covered on one side by sheets of 28 gauge galvanized steel. For the floor 16 gauge steel sheet is used. There is no loss of insulation as there is no rivet or joint going through the inside casing to the outside casing. Six hooks are fixed to the ceiling for the suspension of the bags of solid CO₂. Lifting gear and lashing rings are also provided. To ensure hermetic sealing, the doors are fitted with special hinges and locked by 4 can-type locks.

(World Fisheries Abstract—Nov./Dec. 1958, page 23).

(iii) Danish cold processing method

A Danish engineer has developed a method which makes it possible by cold processing (without the traditional heating of the raw material to 212° F or more) to extract the oil from industrial Herring and other fish. The manufacturing process is very simple, and it is claimed that the herring oil produced is odourless.

The new and unusual part of the method is that with the help of enzymes the fish is liquified by cold processing and the oil separated by centrifuging. The first machine installed manufactures partly oil and partly deoiled liquid Herring. The deoiled product has unusual keeping qualities, and the method indicates a possibility of almost unlimited preservation of ground raw material. The products obtained by the new process

were (1) deoiled Herring pulp (2) Herring oil (3) spray dried Herring pulp (4) a fodder supplement, (5) spray dried cod fillet powder.

In the new procedure, the fish is transformed into fluent fish pulp by chopping and mixing with certain enzyme cultures which are extracted from bacteria and fortified by more enzymes. Two methods are used since two types of cultures are provided.

(a) using one type of culture with lean fish, the admixture can be acidulated to a pH making it adequate for storage as desired. The pulp is a highly valuable fodder supplement.

(b) using the second type of enzymes with fat fish, the admixture can be centrifuged into oil and pulp at a temperature not exceeding 122°F. The de-oiled pulp can be either acidulated, as under (a) or spray dried into almost non-perishable fish powder with all the good points of the fresh fish.

The new method claims the following advantages :—

(1) All the original characteristics (vitamins, enzymes etc.) of the fish are kept in the ideal proportion found in nature in the ready made fish by-products.

(2) Even big quantities of fresh fish can be treated immediately after landing, thereby precluding any spoilage of raw material. The process, being short and simple, demands only very simple machinery and allows storage of the semi-processed product for later successive processing into final products.

(3) The fish oil is centrifuged from fat fish under temperatures so low that the original characteristics of the fish pulp remain intact.

(4) The proteins of the fish are hydrolized into free easily digestible amino acids, pulp and the fish powder therefrom have long keeping qualities, and are rich in proteins.

(Fisheries Newsletter—January, 1958, page 25).

(iv) Slow Ice Melting

A water proof plastic mat that is placed over the top ice in fishing boat holds and cuts down the melting rate of the ice considerably is being marketed by Scott Plastic Products. The mats do not rot, are light and easy to stow, and are easily cleaned by hosing.

(Fisheries Newsletter—November, 1957, page 9).

(v) Salt, Fresh Ice Tests

Salt water and fresh water ice were used in comparative preservation studies of gutted Haddock on the U.S. Bureau of Commercial Fisheries research vessel, Delaware. No significant differences in preservative effects were noted. The fish stored under laboratory conditions, remained off from excellent to good quality until the ninth day of iced storage, and of acceptable quality upto the thirteenth day. The fish stored in salt water ice

cooled faster and to a lower temperature than the fish stored in fresh water ice. However, the salt water ice melted faster and therefore more ice was needed to maintain the desired temperature.

(Fisheries Newsletter—November, 1957, page 31).

FISH PRODUCTS

Fish Oil

(i) **Tanning with Body oil**

Fish liver oils have been used in the tanning of leather for a long time, but fish body oils have been considered unsuitable for this purpose. This assumption has been proved erroneous by recent research in U.S.A. Fish body oils can be used to make the same grade of leather now produced with imported fish liver oils. The latter are about 20 per cent dearer than the domestically produced fish body oils.

(Fisheries Newsletter—June, 1958, page 33).

GENERAL FISHERY NEWS

Atomic energy and world fisheries development

Dr. Silow, in his report on "The Potential Contribution of Atomic Energy to Development in Agriculture and related Industries," says that radio isotopes and radiation can accelerate and enhance the contributions of research to the development of World Fisheries. He pointed that the water provides less than two per cent of world food supply which represents about ten per cent of the animal protein consumed and therefore, every effort should be made to increase the world's fish production which can be achieved by better management and fishing operations and also by effecting advantageous changes in the fisheries resources which in turn calls for the comprehensive investigation of the resources and in such research radio isotopes can be of particular help and the success of such research will permit a better planning of fishing operations and more efficient use of resources. Further, he adds that the application of nuclear power could be of considerable significance to the fishing industry. The introduction of small nuclear propulsion plant would result into decrease in size of vessel, increase in speed or the fish-hold space or fish processing space increased for the same sized hull.

(Trade News—Jan. '59)

Ultra-Violet Films

Russian scientists have developed an ultra-violet search light for use with underwater television cameras in making films of fish in their natural surroundings. Previously powerful lights were used which, while they attracted some fish, frightened away others from the deeper parts of the ocean, where no light penetrates. The films are made from a bathysphere.

(Fisheries Newsletter—August, 1957, page 27).

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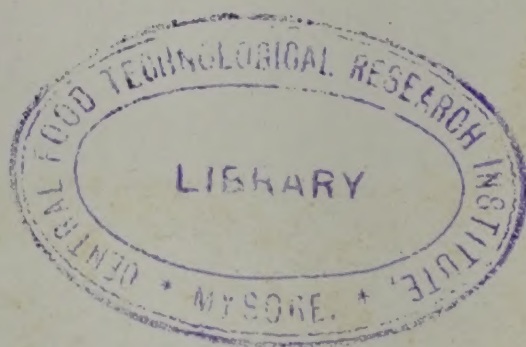
The 1957 edition of Fisheries Year Book and Directory achieved a record of almost 500 pages and introduces a new feature—a bibliographical index of books on fish, fishing, and the manufacture of fishery products, compiled by E. Hardy, F.Z.S. The introductory special articles in the Book include three chapters by well known experts on the processing and preservation of fish by the various known methods; trends in fishing vessel construction and equipment and specific examples of modern craft are described in detail and well illustrated.

The World Survey comprises reports on fish catches, exports, imports, curing, canning, quick freezing and so on, in the leading fishing countries, and the World Directory lists firms covering fishing vessel owners, exporters, importers, wholesalers, processors, and suppliers of craft, equipment, and processing machinery and materials in 68 countries. The year book is published by British-continental Trade Press Ltd. 222, Strand, London.

(Fisheries Newsletter—October, 1957, page 21).

Sea Law Conference to discuss limits

The legal Committee of the United Nations General Assembly announced to hold a second International Conference of Plenipotentiaries on the Law of the Sea, in Geneva. The dates are to be fixed later. The purpose of the meeting would be to determine the extent of territorial waters and fishing limits. The Committee felt that the Conference would contribute substantially to the lessening of international tensions.



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